



DEHN protects  
cell sites





## DEHN protects cell sites

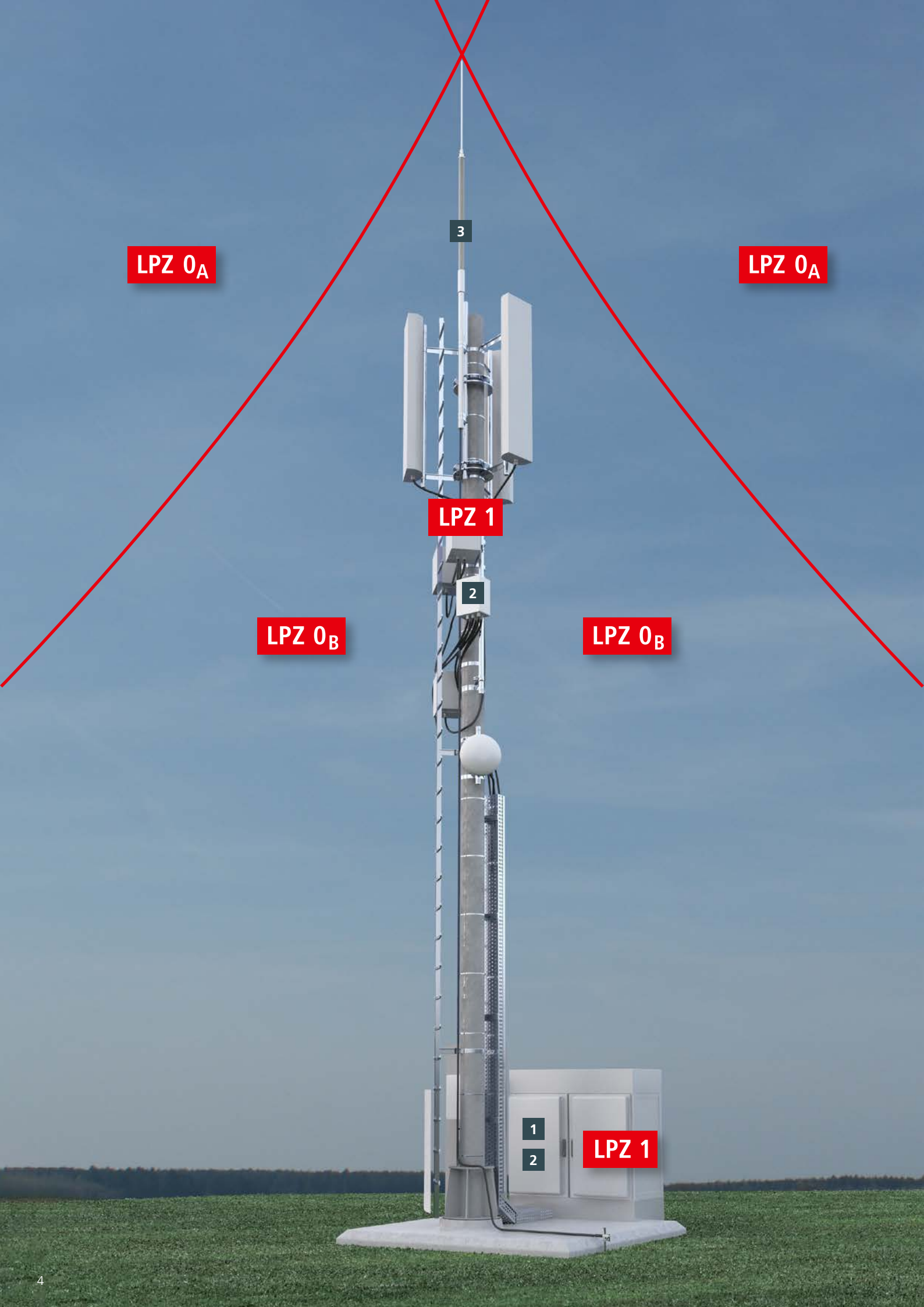
A great deal of change is going on in Germany: the planning and implementation of new mobile radio sites; the renovation and expansion of existing network infrastructure. And in the era of 5G, the Internet of Things and autonomous driving, the increasing demand for transmission capacities and network availability requires the constant expansion of existing structures.

The main goal? The availability of installations and systems in cell sites. But it is precisely because of the exposed position of mobile phone masts that direct lightning strikes occur again and again, which incapacitate entire systems. Damage is also frequently incurred from surges; e.g. in the event of a lightning strike within the vicinity of a mobile radio sites. People standing near to an installation during a thunderstorm are also endangered.

### Ensure availability – protect human lives

A comprehensive lightning and surge protection concept ensures optimum protection of human lives and highly available systems. DEHN has been developing specially adapted products and solutions for mobile radio sites for more than 35 years. Whether it is earthing, equipotential bonding or lightning and surge protection: DEHN supports network operators, power supply companies, system technology suppliers, installers and equipment suppliers as an all-in-one supplier.

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LPZ 0<sub>A</sub>

LPZ 0<sub>A</sub>

3

LPZ 1

2

LPZ 0<sub>B</sub>

LPZ 0<sub>B</sub>

1

2

LPZ 1

# The lightning protection zone concept

Lightning damage to antennae, remote radio units, base stations and power supply systems is not uncommon. That is why lightning protection concepts are required that are based on the international standard IEC 62305. This defines the selection and arrangement of protection measures. The majority of cell sites are implemented to protection class 3; sites with an increased risk potential are implemented to protection class 2 or higher.

The lightning protection of a cell site consists of an external (4) and an internal lightning protection system with surge protective devices (1–3). For the planning of the protection measures, the cell site is divided into lightning protection zones:

## LPZ 0

This is the outer zone which is threatened by the unattenuated lightning electromagnetic field. The internal systems may be subjected to the full lightning current. LPZ 0 is subdivided into:

### LPZ 0<sub>A</sub>







Parts of an installation threatened by direct lightning strikes and the full lightning electromagnetic field.

### LPZ 0<sub>B</sub>

Parts of an installation protected against direct lightning strikes but threatened by the full lightning electromagnetic field. Both zones are determined with the rolling sphere method.

## LPZ 1

This zone is protected against direct lightning strikes. However, short strokes must be limited by current sharing, isolating interfaces or surge protective devices at the zone boundaries.

Products			
DEHNvap			
1		<p>The infrastructure in main and installation power supply systems is protected with proven combined arresters (combined lightning current and surge arresters) of the DEHNvap product series. They protect the 230 / 400-V power supply of cell sites and can be used universally, irrespective of the feeding system configuration. All DEHNvap models offer reliable protection for TT and TN-S systems (3+1 configuration)</p>	<p>You can find further information on the Internet</p> <p>More information: <a href="https://de.hn/7D6nw">de.hn/7D6nw</a></p> 
DEHNsecure			
2		<p>The DEHNsecure product series has been specially developed for the DC requirements of remote radio units. The modularly structured arrester is designed and tested for the high operating currents of the 48-V DC supply. Mains follow currents are prevented from forming through the structure of the DEHNsecure spark gap and the device concept employed. The module locking system withstands vibrations and severe mechanical stresses during a discharge process.</p>	<p>You can find further information on the Internet</p> <p>More information: <a href="https://de.hn/7eEEB">de.hn/7eEEB</a></p> 
HVI Lightning Protection			
3		<p>Separation distances are important when installing an external lightning protection system on cell sites. The risk of flashovers between the external lightning protection system and components of the radio system (e. g. antennae, RRUs) is reliably prevented using adequate spacing and with a high-voltage-resistant, insulated HVI Conductor from DEHN. It has a lightning-current-conducting copper conductor shielded with thick-walled, high-voltage-resistant insulation, thus able to discharge lightning currents of up to 200 kA. DEHN offers the right HVI Conductor for every application. A wide range of accessories ensures quick and simple installation with the right fasteners.</p>	<p>You can find further information on the Internet</p> <p>More information: <a href="https://de.hn/AB612">de.hn/AB612</a></p> 



## Surge protection for AC applications

A comprehensive network worldwide – that’s what 5G is for. In order to manage this technological leap, more and more mobile radio sites are needed. This is where limited installation spaces and ever smaller installation areas represent a challenge.

**As a rule**, the smaller the systems the better.

The rapid development on the market therefore requires new product solutions and places new demands on protective devices:

- They must be small to be optimally integrated into compact mobile communication systems.
- They must be robust in order to protect the sensitive mobile communication technology reliably.

Proven protective devices have been available up until now either in modular or compact form. Modularly structured – in a 3+1 configuration – they require 8 modules; i.e. they simply take up too much space in many an application. Compact devices, on the other hand, require only 4 modules, but then are not pluggable.



- Space-saving
- Modular
- Robust



### The solution: DEHNvap NG

This latest-generation combined arrester optimally incorporates the low space requirements of only 4 modules with the comfort of a modular protective device.

In AC applications, the power supply of the cell site functions independently of that of the building, and is therefore implemented as a separate supply line. Proven DEHN combined arresters (combined lightning current

and surge arresters) protect the infrastructure in the main and system power supply. These combined arresters are characterised by an especially high follow current extinguishing capability and follow current limitation capacity, which prevents nuisance tripping of system fuses.




This means cell sites run reliably and with a high degree of availability.

## General information on the DEHNvap product series



- Protection of the 230/400-V power supply of cell sites in the main distribution board
- Prewired, spark-gap-based combined arresters (type 1+2)
- Energy-coordinated with power supply systems for cell sites
- For universal use for three-phase TT and TN-S systems (3+1 configuration) with a floating remote signalling contact
- Maximum system availability due to follow-current-limiting spark gap technology
- Within 10 m: protection of terminal equipment – no additional SPDs necessary

More information:  
[de.hn/7D6nw](https://de.hn/7D6nw)



Products	Our recommendation		
DEHNvap	DVA M NG 3P 100 FM	DVA CSP 3P 100 FM	DVA CSP 3P 100 S FM
<b>Discharge capacity</b> Lightning current impulse (10/350) ( $I_{imp}$ ) Nominal impulse discharge current (8/20 $\mu$ s) ( $I_n$ )		25/100 kA 25/100 kA	
<b>Voltage protection level (<math>U_p</math>)</b>		$\leq 1.5$ kV	
<b>Standard DIN modules</b>	4 modules	8 modules	4 modules
<b>Design</b>	Modular (simple module change without tools)	Modular (simple module change without tools)	Compact
<b>Wiring</b>	Series connection with STAK 25 pin-shaped terminal <a href="#">See accessories</a>	Double terminal for simple series connection	Series connection with STAK 25 pin-shaped terminal <a href="#">See accessories</a>
<b>Part no.</b>	<b>900 352</b> 	<b>900 360</b> 	<b>900 367</b> 

You can find information on more models on the Internet

Accessories		Type	Part no.
	<b>Pin-shaped terminal</b> For the implementation of an EMC-optimised series connection of DEHNvap NG combined arresters as per IEC 60364-5-53 Allows series connection (connection of two conductors) of surge protective devices up to 25 mm <sup>2</sup>	<b>STAK 25</b>	<b>952 589</b>
	<b>DEHNgard modular</b> Modular, coordinated surge arrester for installation into the sub-distribution board of the transmitter. Increases the protective effect where the protection of terminal equipment by the combined arrester is no longer sufficient in certain circumstances (outside the protected range of 10 m)	<b>DG M TT 275 FM</b>	<b>952 315</b>



## Surge protection for DC applications

Once the AC side is optimally protected with DEHNvap NG, the safeguarding of the DC side is the next issue.

In addition to protecting the power supply, the injection of surges and lightning currents into DC systems must be prevented. Active antenna systems or remote radio units are examples of systems that need to be protected separately because they are particularly exposed.

This is why the standard DIN EN 62305 (IEC 62305) requires a type-1 lightning current arrester at the boundary between lightning protection zone  $O_B$  and 1. In mobile communication stations, this zone boundary is usually the outlet of the base station.

### Protecting the power supply

An exceptional solution for the protection of the power supply is the OVP box with the single-pole type-1 arrester DEHNsecure. The weather-resistant box is installed directly at the outlet of the base station and prevents partial lightning currents from entering the system. All conductors leading in to the cell site are reliably protected against surges and lightning currents with the coordinated lightning current arrester DEHNsecure.

### What else needs protecting?

Remote radio units and active antenna systems are installed directly on the mast. The advantages are obvious: short antenna cables reduce signal attenuation; and open-mounted units do not require cooling. However, due to their exposed position, they are highly susceptible to damage from lightning. Mobile communication components are delicate and expensive in terms of their procurement and maintenance. For this reason, it is imperative they are safeguarded against lightning damage and damage from overvoltage. A carefully planned protection concept is necessary and useful here.



## The protection concept

In practice, a comprehensive protection concept might look like this:

### Situation 1

The cable length from the protective device to the remote radio unit or the active antenna system is less than 20 m:

Here the OVP box with DEHNsecure is installed directly at the outlet of the base station.

### Situation 2

The cable length is greater than 20 m:

Due to the components being in immediate proximity to the earthing conductors, there is a risk of lightning currents being coupled. In this case, an additional OVP box with the two-pole type-1 arrester DEHNsecure is installed directly on the mast near the remote radio unit or on the active antenna system.



## More advantages with the DC box

### Save on materials

By installing an additional OVP box directly on the mast, the individual supply lines to the components (remote radio unit, active antenna system) can be done away with. Shorter total length also means less conductor material – this reduces the costs in the project.





### Quick installation

An additional benefit is provided during installation. Only one supply line to the OVP box and short conductors coming out of it to the components – this saves a lot of time during installation.

### Easy maintenance

When using an OVP box, the active transmission system can be switched on and off directly on the mast – this is practical, because the power supply does not have to be interrupted at the base.

Another advantage in practice: the status of the fuse (on/off) is visible at a glance – this gives the installer extra certainty.

Products		Type	Part no.
	<b>DEHNsecure</b> Coordinated, modular, spark-gap-based, single-pole lightning current arrester. Discharge capacity of 25 kA (10/350 µs). To protect the 48-V DC power supply.	<b>DSE M 1 60 FM</b>	<b>971 126</b>
	<b>DEHNsecure</b> Coordinated, modular, spark-gap-based, two-pole lightning current arrester. Discharge capacity of 50 kA (10/350 µs). To protect the 48-V DC remote radio unit.	<b>DSE M 2P 60 FM</b>	<b>971 226</b>
	<b>Overvoltage protection box (OVP box)</b> For the weather-resistant outdoor installation of the DEHNsecure lightning current arrester. To protect the power supply at the outlet of the base station or directly on the mast to protect the active components (antenna systems, remote radio units).	The OVP box is configured to your specific application. <div style="text-align: right;">  </div>	



More information:  
[de.hn/bvcDS](https://de.hn/bvcDS)





Photo: Telefonica

## Isolated external lightning protection

When modifying or installing a new rooftop mobile communication system, the conditions specific to the site raise questions for the planning of the lightning protection system: does the hosting building have its own lightning protection system into which the radio system can be integrated? Is an air-conditioning system or a photovoltaic system installed in the roof area?

Compliance with separation distance between the metal or electric installations of the rented building and the components of the radio system (such as antenna structures or cable routes) mostly proves to be a special challenge.

The ideal solution is to arrange a separate external lightning protection system with high-voltage-resistant, insulated HVI Conductors. They withstand the highest loads from lightning currents. An HVI installation can be perfectly adapted to various site conditions or special architectural features.

### Products



#### HVI Lightning Protection

Depending on their configuration, lightning protection systems are installed in the conventional manner by routing a round wire on the roof, or also in combination with insulating materials. The general protection goal is preventive fire protection. A risk of flashovers between the external lightning protection system and electrically conductive parts can be reliably prevented using adequate spacing, but also with a high-voltage-resistant, insulated down conductor – the HVI Conductor from DEHN.

The HVI Conductor has a lightning-current-conducting copper conductor shielded with thick-walled, high-voltage-resistant insulation.

With it, lightning currents of up to 200 kA can be safely discharged.

We offer the right HVI Conductor for every application.

Our wide range of accessories ensures quick and simple installation with the right fasteners.

You can find further information on the Internet

More information:  
[de.hn/8qocG](https://de.hn/8qocG)







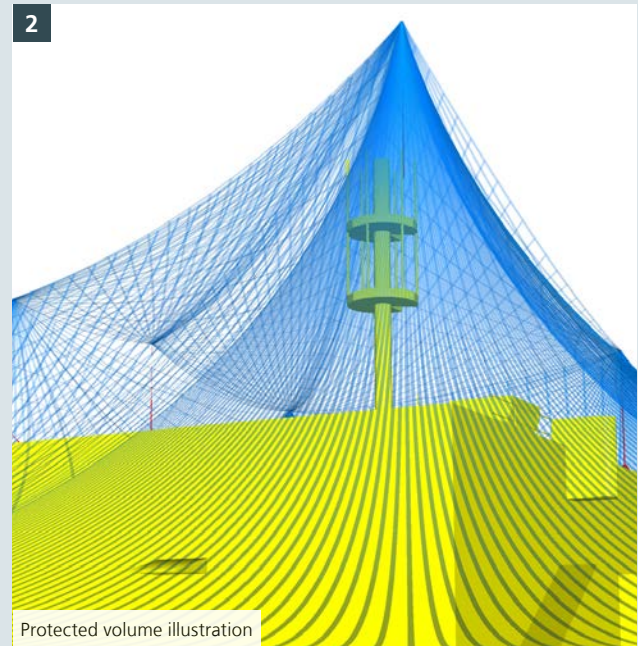


## Surge protection for radio transmission technology

For radio transmission technology, choosing surge protective devices according to the frequency band and the connection system is recommended. For radio relay systems, you require a sufficiently high discharge capacity and remote power feeding voltages.

The DEHNgate product series has you covered in both respects. It manages high lightning currents, supports multi-carrier systems and impresses with its ease of maintenance and servicing.

Products		Type	Part no.
	<b>DEHNgate</b> Arrester suitable for remote supply with exchangeable gas discharge tube and excellent RF service life.	<b>DGA AG N</b>	<b>929 045</b>
	<b>DEHNgate</b> Arrester with maintenance-free quarter-wave technology for multi-frequency applications (multi-carrier systems).	<b>DGA LG 7 16 MFA</b> <b>DGA L4 7 16 B</b>	<b>929 146</b> <b>929 148</b>
	<b>Equipotential bonding bar</b> Industry, 8 terminals.	<b>PAS I 8AP M10 V2A</b>	<b>472 229</b>
	<b>Equipotential bonding bar</b> K12 with snap-on terminals.	<b>PAS 11 AK UV</b>	<b>563 201</b>



## DEHNconcept – planning lightning protection systems for mobile communication data centres

Fit for the future. With standardised lightning protection solutions on MSC sites, always well equipped for new technologies and for enhancements to a system or building.

### With DEHNconcept, simplify system expansions and reduce implementation and maintenance costs.

Strategically important data centres – also referred to as mobile service/switching centres (MSCs) – of mobile network operators were predominantly set up in the 90s. They are a central component of the recognised generations of mobile technology, such as GSM, UMTS, Long-Term Evolution (4G) up to today's fifth generation (5G). In the past, new technologies led to repeated upgrades on roof surfaces. In order to ensure the system availability of these central data centres in the future, external lightning protection systems and earthing systems are constantly being expanded and optimised. Here, standardised lightning protection solutions simplify the integration of new and existing system technology. Pre-defined protected volumes render new lightning protection measures superfluous.

However, since the buildings at different sites vary greatly in terms of structure and equipment, maintaining the separation distances between all metal and electrical installations is a particular challenge. It is precisely here that the advantage of a 3D plan is demonstrated.

### Reliably maintain separation distances

With the help of a 3D plan, an insulated lightning protection system with HVI\* is conceived. A set-up with a high-voltage-resistant HVI Conductor ensures the correct separation distances from the roof to the ground level. Any deficiencies with the existing lightning protection system are rectified with this work step.

Another advantage is that a large portion of the 3D plan can be used as system documentation after implementation.

\* HVI (High Voltage Insulation) Conductor – high-voltage-resistant, insulated down conductor



## 3D plan in practice – step by step

### Step 1 Supply documents

The mobile network operator supplies the available test reports (e. g. TÜV [German Technical Inspectorate] reports), lightning protection check lists and documentation of site inspections. If system documentation is not yet available, a site inspection can be performed by an electrical installation contractor.

### Step 2 3D plan of the lightning protection concept

as insulated lightning protection with HVI by the DEHNconcept team. This step also includes a detailed concept description, a bill of materials and a depiction of the protected volume, with all the relevant details for an insulated lightning protection solution.

### Step 3 Designing the external lightning protection system

by a specialist company qualified in lightning protection construction.

## Good to know:

An existing, functional earthing system will be incorporated into the 3D plan, thus avoiding costly construction measures as much as possible. Existing air-termination systems and meshes on roofs are used or dismantled based on their potential utility.

## The next step: the internal lightning protection system

The primary goal of the protective measures is permanent availability of the mobile communication technology. That is why, in addition to the external lightning protection system, the internal lightning protection system, coordinated in tandem, is now also taken into account. The protective circuits of all the supply lines fed in to the MSC from outside are checked at the entrance point into the building. Antennae and air-conditioning systems or external emergency power systems – this will tell you if an upgrade to surge protection is necessary.

## DEHNconcept at a glance

- All plans of the new external lightning protection system must be in accordance with Part 3 of the lightning protection standard DIN EN 62305 (IEC 62305).
- The 3D plan with DEHNconcept enables a uniform design of MSC sites with insulated (HVI) and/or conventional lightning protection systems. Existing, functional earthing systems will be taken into account and integrated.  
**This means:** reduced investment costs due to standardised lightning protection solutions and easier maintenance and expansion of systems.
- The building and system protection of MSC sites is raised to the state of the art by the 3D lightning protection plan.  
**This means:** high system availability and ideal foundations in terms of the requirements of future mobile communication technologies.
- The mobile network operator receives all the data regarding system documentation. With a DEHNplan software licence, the plans can be updated to draw in additional parts of an installation on the roof surface or to reposition air-termination rods.
- The comprehensive lightning and surge protection concept reliably ensures optimum protection and high-availability systems.



We look forward to hearing from you.

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More information:  
[de.hn/2xVFC](https://de.hn/2xVFC)





## DEHN protects active mobile communication components on Vodafone LTE sites

Vodafone is driving the expansion of LTE in Germany. Since the start of 2019, around 1,500 LTE construction projects have been realised, with another 3,800 projects to follow. The aim is to increase LTE capacities while simultaneously eradicating dead spots. Around 18,000 LTE masts throughout Germany provide the population with mobile communication. In addition to rural regions, major traffic routes are also the focus of network expansion. LTE is currently around 97% available along the German autobahns.

### Challenges for DEHN

New and expanded mobile radio sites are immediately connected to the core network. To optimally protect these powerful transmitters from the consequences of lightning strikes and surges, special measures are required. The power supply to these sensitive mobile communication components demands customised solutions tailored to the conditions on site.

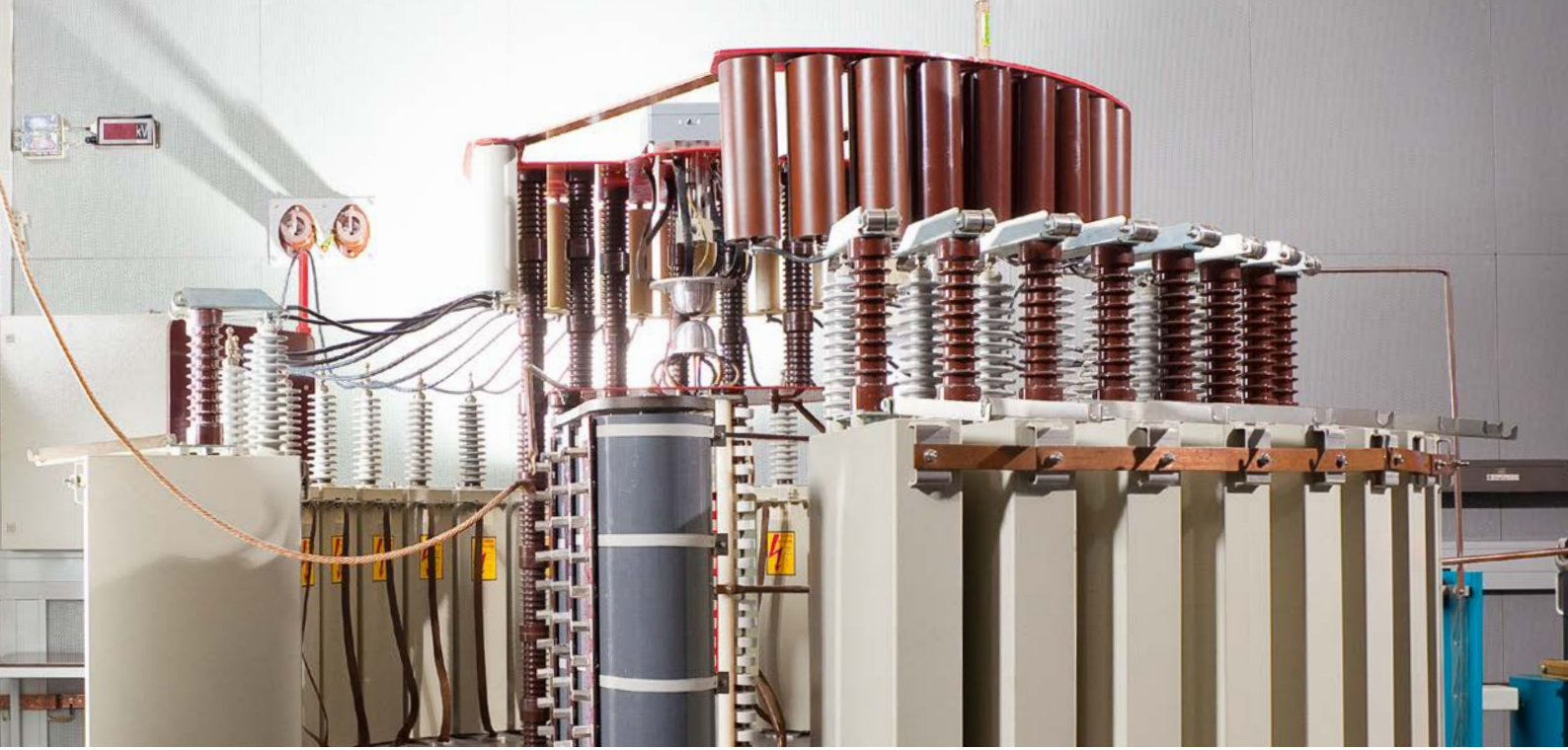
### Solution

For these special requirements, previous concepts were not able to be adapted to customer-specific specifications. That is why DEHN developed the overvoltage protection box (or OVP box, for short) for DC voltage systems based on precisely these criteria. It is a customised system solution for the integration of lightning and surge protection, based on a high discharge capacity of 25 kA (10/350  $\mu$ s) of the DEHNsecure lightning current arrester.



More information:  
[de.hn/bvcDS](https://de.hn/bvcDS)





## Practical test in the DEHN Test Centre

In the DEHN Test Centre, the lightning current withstand capability of the OVP box was subsequently verified and technical approval granted. In the power surge laboratory, the lightning current withstand capability of system components in cell sites is generally tested and DEHN products are coordinated with downstream mobile communication equipment – all upon the customer's instruction. As an operator, system integrator or manufacturer, you will find the following engineering and testing services:

- Lightning current tests on passive and active antennae
- Lightning current on high-frequency and installation cables
- Coordination tests with downstream input protective circuits of AC/DC power supplies
- Testing of prewired customer-specific connection units
- Switchgear assemblies for protecting the electrical installation

The DEHN Test Centre is equipped with high-performance devices. Tests are conducted according to current national and international standards. Thanks to decades of work in standardisation committees, DEHN employees boast in-depth and always up-to-date knowledge of standardisation and technical fundamentals. This guarantees top-quality engineering and testing services – and protection concepts for mobile communication applications remain practical.

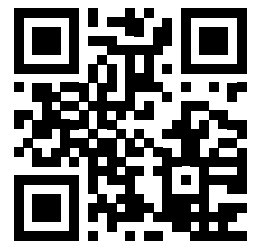
 More information:  
[de.hn/ayxkJ](https://de.hn/ayxkJ)



Surge Protection  
Lightning Protection/Earthing  
Safety Equipment  
DEHN protects.

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